IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application : **10/501,426**

Applicant(s) : **APREA et al.**

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Examiner : **SAINT CYR, Leonard**

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Title: **AUDIO CODING**

Mail Stop: **APPEAL BRIEF - PATENTS**
Commissioner for Patents
Alexandria, VA 22313-1450

APPEAL UNDER 37 CFR 41.37

Sir:

This is an appeal from the decision of the Examiner dated 5 August 2008, finally rejecting claims 1-21 of the subject application.

This paper includes (each beginning on a separate sheet):

1. **Appeal Brief;**
2. **Claims Appendix;**
3. **Evidence Appendix; and**
4. **Related Proceedings Appendix.**

APPEAL BRIEF

I. REAL PARTY IN INTEREST

The above-identified application is assigned, in its entirety, to **Koninklijke Philips Electronics N. V.**

II. RELATED APPEALS AND INTERFERENCES

Appellant is not aware of any co-pending appeal or interference that will directly affect, or be directly affected by, or have any bearing on, the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-21 are pending in the application.

Claims 1-16 stand rejected by the Examiner under 35 U.S.C. 101.

Claims 17-21 stand rejected by the Examiner under 35 U.S.C. 112, first paragraph.

Claims 1-4, 13-17, and 19-21 stand rejected under 35 U.S.C. 102(a).

Claim 18 stands rejected under 35 U.S.C. 103(a).

These rejected claims are the subject of this appeal.

IV. STATUS OF AMENDMENTS

No amendments were filed subsequent to the final rejection in the Office Action dated 5 August 2008. A reply to the final rejection was filed on 6 October 2008.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The invention addresses a method and system for audio encoding the audio portion of audio-video material. The techniques used for audio and video encoding are fundamentally different, and a variety of standards are used for each (applicants' pages 8-9, Tables 1-4). When the audio and video frame boundaries do not coincide, as is generally the case, the splicing of audio-video streams can lead to a loss of lip-sync, and may introduce audio artifacts, such as mutes, or slips (page 9, lines 15-18). This invention provides an audio encoding scheme that provides an integer number of audio frames within each sequence of M video frames (integer M=>1), thereby allowing synchronous splicing at the boundary of each sequence (page 10, lines 8-10). As is known, the application of cross-fade at a decoder allows for the loss of data between audio frames. This invention selectively discards a portion of data at the beginning and end of each frame to provide the alignment of audio frames to the video sequence boundaries. Each audio frame includes a number of blocks, and the alignment of audio frames to video frames results in a certain amount of overlap of blocks at the beginning and end of each audio frame (FIG. 7, blocks 1-4 or 1-5 at the beginning and end of each frame). Preferably the amount of overlap between frames is relatively constant, varying by only one block length. By defining a particular sequence of audio frame lengths that corresponds to M video frame lengths, the number of blocks to be dropped from each audio frame, or equivalently the size of each overlap between audio frames, is determined (page 3, lines 6-10). For example, in FIG. 7, a sequence of two video frames equals 125 audio blocks; a repeating sequence of audio frame lengths of 32-31-31-31 will assure that every sequence of four audio frames aligns with every two video frames, and these audio frame lengths are provided by a repeating sequence of overlap lengths of 4-5-5-5 (the number of non-crossed-out blocks at each audio frame boundary) (page 20, line 24 - page 21, line 9).

As claimed in independent claim 1, the invention comprises a method of audio encoding a stream that carries audio and video data (page 2, lines 33-34), including:

encoding the audio data to provide a mean effective audio frame length $\overline{F}$ that equals a video frame length $1/f_v$ over an integral number M video frames (page 2, line 34 - page 3, line 1),

wherein the encoding includes varying lengths *F* of the audio frames j in a defined sequence of frame lengths $F(j)$ (page 3, lines 1-2; FIG. 7).

As claimed in dependent claim 3, the invention comprises the method of claim 1, wherein the value $F(j)$ repeats periodically on *j*, the periodicity of $F(j)$ defining a sequence of frames (page 3, lines 6-7).

As claimed in independent claim 13, the invention comprises a method of audio encoding a stream that encodes audio and video data, including

encoding audio samples of N quasi video-matched audio frames in frames with a defined sequence of overlap lengths (page 3, lines 6-10),

wherein an effective length of the audio frames coincides with a length of a sequence of M video frames, where M and N are positive integers (page 3, lines 21-28; FIG. 7).

As claimed in independent claim 17, the invention comprises an audio encoder for coding audio for a stream that carries audio and video data, wherein the encoder produces audio frames of variable length such that a mean effective audio frame length $\overline{F}$ equals the video frame length $1/f_v$ over an integral number M video and N audio frames, and the audio frames j each have a variable overlap that provides an effective length *F* in a defined sequence of frame lengths $F(j)$ at encoding (page 4, lines 24-28; FIG. 7).

As claimed in dependent claim 18, the invention comprises the audio encoder of claim 17, where the variable overlaps include a total of *p* short overlaps of length *O* and a total of *q* long overlaps of length *O+* in an overlap sequence, the encoder calculating the overlap sequence using an algorithm that repeats after N frames (page 4, lines 29-31).

As claimed in independent claim 19, the invention comprises an audio decoder for decoding a stream that encodes audio and video data, wherein the decoder calculates an expected effective frame length of an incoming frame based on a defined sequence of frame lengths, adjusts the actual length of the incoming frame to make it equal to the expected frame length, determines whether any block within a received frame is a redundant block or a non-redundant block, mapping the non-redundant blocks onto sub-band samples (page 5, lines 1-5; FIG. 8).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-16 stand rejected under 35 U.S.C. 101.

Claims 17-21 stand rejected under 35 U.S.C. 112, first paragraph.

Claims 1-4, 13-17, and 19-21 stand rejected under 35 U.S.C. 102(a) over Fielder et al. (USP 6,226,608, hereinafter Fielder).

Claim 18 stands rejected under 35 U.S.C. 103(a) over Fielder.

VII. ARGUMENT

Claims 1-16 stand rejected under 35 U.S.C. 101

35 U.S.C. 101 states:

> "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title."

Claims 1-16

The Office action asserts that claims 1-16 "simply recite an abstract idea for encoding audio"; the applicants respectfully disagree with this assertion. The applicants respectfully maintain that there is nothing 'abstract' about processing audio data in a particular manner so as to assure that a mean audio frame length equals a video frame length over an integer multiple of frames by encoding the audio frames using a defined sequence of audio frame lengths.

The Office action also asserts that the claims fail to show the transformation of subject matter to a different state of things. The applicants respectfully disagree with this assertion, and respectfully maintain that the encoding of audio data conforms to the classic definition of a transformation. By controlling the frame length of the encoded audio frames, the suitability of the transformation for subsequent splicing can be assured; by providing a defined sequence of frame lengths, the suitability of the transformation for decoding with cross-fade, or other techniques, can be assured.

The Office action also asserts that the claims preempt an abstract idea for encoding audio data to align with video frames. The applicants respectfully disagree with this assertion, and note that a variety of methods are available for aligning audio and video frames, including, for example, the adaptive sizing of audio frames based on content, such as taught by Fielder, referenced in the Office action. As such, it cannot be said that providing a defined sequence of frame lengths, as claimed, preempts all techniques for encoding audio data to align with video frames.

Because claims 1-16 address a new and useful process for encoding audio data so as to assure lip-sync and avoid audio artifacts during the rendering or splicing of audio-video material, the applicants respectfully maintain that claims 1-16 are patentable under 35 U.S.C. 101, and respectfully request that the rejection of these claims under 35 U.S.C. 101 be reversed by the Board.

Claims 3-12

Claim 3, upon which claims 4-12 depend, specifically recites that the aforementioned sequence of audio frame lengths is periodic.

The applicants respectfully maintain that further limiting a sequence of audio frame lengths to be periodic can not be said to preempt all methods of encoding audio data to align audio and video frame boundaries, as asserted in the Office action. Accordingly, the applicants respectfully request that the rejection of claims 3-12 under 35 U.S.C. 101 be reversed by the Board.

Claims 17-21 stand rejected under 35 U.S.C. 112, first paragraph

35 U.S.C. 112, first paragraph states:

> "The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention."

Claims 17-18

Claim 17 claims an audio encoder for coding audio for a stream that carries audio and video data, wherein the encoder produces audio frames of variable length such that a mean effective audio frame length $\overline{F}$ equals the video frame length $1/f_V$ over an integral number M video and N audio frames, and the audio frames j each have a variable overlap that provides an effective length F in a defined sequence of frame lengths $F(j)$ at encoding.

This claim finds sufficient support in the applicants' specification to enable one of skill in the art to make and use this invention at page 11, wherein the determination of the overlap is provided for each of the three typical approaches defined at page 10, lines 21-27. Further, an algorithm for determining the overlap for each frame is provided at page 17, lines 5-15.

Because the specification includes a written description that provides full, clear, concise, and exact terms so as to enable one of skill in the art to make and use the invention as claimed in claim 17, the applicants respectfully maintain that the rejection of claim 17 under 35 U.S.C. 112, first paragraph, is unfounded, and should be reversed by the Board.

Claim 18

In like manner, claim 18 finds support at page 10, lines 6-19, so as to enable one of skill in the art to make and use the claimed invention. Accordingly, the applicants respectfully maintain that the rejection of claim 18 under 35 U.S.C. 112, first paragraph, is unfounded, and should be reversed by the Board.

Claim 19

Claim 19 finds support at page 19, lines 14-20, so as to enable one of skill in the art to make and use the claimed invention. Accordingly, the applicants respectfully maintain that the rejection of claim 19 under 35 U.S.C. 112, first paragraph, is unfounded, and should be reversed by the Board.

Claims 20-21

Claims 20-21 finds support at page 19, lines 6-13, so as to enable one of skill in the art to make and use the claimed invention. Accordingly, the applicants respectfully maintain that the rejection of claims 20-21 under 35 U.S.C. 112, first paragraph, is unfounded, and should be reversed by the Board.

Claims 1-4, 13-17, and 19-21 stand rejected under 35 U.S.C. 102(a) over Fielder

MPEP 2131 states:

> "A claim is anticipated only if ***each and every element*** as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)... "The ***identical invention*** must be shown in as ***complete detail*** as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Claims 1-4

Fielder does not teach encoding audio data using varying lengths of the audio frames in a defined sequence of frame lengths, as specifically claimed in claim 1, upon which claims 2-12 depend.

Fielder teaches framing audio data based on the content of the audio data frame:

> "The audio information is analyzed to determine various characteristics of the audio signal such as the occurrence and location of a transient, and a control signal is generated that causes the adaptive block-encoding process to encode segments of varying length." (Fielder's Abstract, lines 5-9.)

As is clearly stated in Fielder's Abstract, Fielder's encoding is based on the particular characteristics of the audio signal being encoded. Accordingly, the applicants respectfully maintain that Fielder cannot be said to teach encoding the audio data using a defined sequence of audio frame lengths.

The Office action asserts that Fielder teaches a defined sequence of frame lengths at column 5, line 65 - column 6, line 8. The applicants respectfully disagree with this assertion. At the cited text, Fielder teaches:

> "a respective encoded information frame corresponds to a respective video frame and includes control information conveying lengths of segments of audio information in a sequence of overlapping segments, a respective segment having a respective overlap interval with an adjacent segment and the sequence having a length equal to the frame interval plus a frame overlap interval, and blocks of encoded audio information, a respective block having a respective length and respective content that, when processed by an adaptive block-decoding process, results in a respective segment of audio information in the sequence of overlapping segments." (Fielder, column 5, line 65 - column 6, line 8.)

As is clearly evident, at this cited text, Fielder does not address encoding audio data in accordance with a defined sequence of frame lengths. Each of Fielder's audio frames is sized based on it content, and then an overlap interval for each frame is selected so as to align the audio and video frame boundaries.

There is no "defined sequence" of audio frame lengths in Fielder; Fielder teaches a method in which the size of each frame is determined based on the audio content. Fielder's process includes:

> "generating a control signal in response to the characteristics of the audio information... wherein the block encoding process adapts segment lengths in response to the control signal" (Fielder, column 5, lines 36-41).

Because Fielder fails to teach encoding audio data using varying lengths of the audio frames in a defined sequence of frame lengths, as specifically claimed in claim 1, the applicants respectfully maintain that the rejection of claims 1-4 under 35 U.S.C. 102(a) over Fielder is unfounded, per MPEP 2131, and should be reversed by the Board.

Claims 3-4

Fielder does not teach a defined sequence of audio frame lengths that repeats periodically, as specifically claimed in claim 3, upon which claims 4-12 depend.

The Office action asserts that Fielder teaches a defined sequence of audio frame lengths that repeats periodically at page 6, lines 1-5. The applicants respectfully disagree with this assertion. At the cited text, Fielder teaches:

> "sequence of overlapping segments, a respective segment having a respective overlap interval with an adjacent segment and the sequence having a length equal to the frame interval plus a frame overlap interval, and blocks of encoded audio information, a respective block having a respective length" (Fielder, column 6, lines 1-5).

As is clearly evident, the cited text does not disclose a periodic sequence of audio frame lengths. Accordingly, the applicants respectfully maintain that the rejection of claims 3-4 under 35 U.S.C. 102(a) over Fielder is unfounded, per MPEP 2131, and should be reversed by the Board.

Claims 13-16

Fielder fails to teach encoding audio samples of N quasi video-matched audio frames in frames with a defined sequence of overlap lengths, wherein an effective length of the audio frames coincides with a length of a sequence of M video frames, where M and N are positive integers, as specifically claimed in claim 13, upon which claims 14-16 depend.

As noted above, Fielder teaches controlling the length of each audio frame based on the content of the audio frame, and not based on a defined sequence of overlap lengths, as claimed. Accordingly, the applicants respectfully maintain that the rejection of claims 13-16 under 35 U.S.C. 102(a) over Fielder is unfounded, per MPEP 2131, and should be reversed by the Board.

Claim 17

Fielder fails to teach an audio encoder wherein the encoded audio frames each have a variable overlap that provides an effective length in a defined sequence of frame lengths at encoding, as specifically claimed in claim 17, upon which claim 18 depends.

As noted above, Fielder teaches controlling the length of each audio frame based on the content of the audio frame, and not based on a defined sequence of frame lengths, as claimed. Accordingly, the applicants respectfully maintain that the rejection of claim 17 under 35 U.S.C. 102(a) over Fielder is unfounded, per MPEP 2131, and should be reversed by the Board.

Claims 19-21

Fielder fails to teach an audio decoder that calculates an expected effective frame length of an incoming frame based on a defined sequence of frame lengths, fails to teach an audio decoder that adjusts the actual length of the incoming frame to make it equal to the expected frame length, and fails to teach an audio decoder that determines whether any block within a received frame is a redundant block or a non-redundant block, mapping the non-redundant blocks onto sub-band samples.

The Examiner provides single composite reference to Fielder to support this rejection: "("effective maximum length… cyclical redundancy check"; col. 5, lines 20-24; Abstract, lines 9-11; col. 15, lines 1-5; col. 29, line 6; col. 5 line 65 - col. 6, line 8)" (Office action, page 6, third paragraph).

The Board of Patent Appeals and Interferences has consistently upheld the principle that the burden of establishing a prima facie case resides with the Office, and to meet this burden, the Examiner must specifically identify where each of the claimed elements is found in the prior art:

> "there must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention. Scripps Clinic & Research Found. v. Genentech, Inc., 927 F.2d 1565, 1576, 18 USPQ2d 1001, 1010 (Fed. Cir. 1991). To meet [the] burden of establishing a prima facie case of anticipation, the examiner must explain how the rejected claims are anticipated by pointing out where ***all*** of the specific limitations recited in the rejected claims are found in the prior art relied upon in the rejection." *Ex Parte Naoya Isoda*, Appeal No. 2005-2289, Application 10/064,508 (BPAI Opinion October 2005).

The applicants respectfully note that it is the duty of the Examiner to specifically identify each and every element and limitation of a claim in the cited reference as per 37 CFR 1.104(c)(2) and MPEP 707, which explicitly state that "the particular part relied on must be designated" and "the pertinence of each reference, if not apparent, must be clearly explained and each rejected claim specified."

The applicants further note that none of the particular cites in the composite site address the decoding of audio frames. In particular, none of the cites teach an audio decoder that calculates an expected effective frame length of an incoming frame based on a defined sequence of frame lengths, adjusting the actual length of the incoming frame to make it equal to the expected frame length, determining whether any block within a received frame is a redundant block or a non-redundant block, and mapping the non-redundant blocks onto sub-band samples, as claimed.

Because the Examiner has failed to provide a prima facie case to support the rejection of claim 19, the applicants respectfully maintain that the rejection of claims 19-21 under 35 U.S.C. 102(a) over Fielder is unfounded, per MPEP 2131, and should be reversed by the Board.

Claim 18 stands rejected under 35 U.S.C. 103(a) over Fielder.

Claim 18

Claim 18 is dependent upon claim 17, and in this rejection, the Examiner relies on Fielder for teaching the elements of claim 17. As noted above, Fielder fails to teach each of the elements of claim 17. Accordingly, the applicants respectfully maintain that the rejection of claim 18 under 35 U.S.C. 103(a) that relies on Fielder for teaching the elements of claim 17 is unfounded, and should be reversed by the Board.

Additionally, Fielder fails to teach or suggest an audio encoder wherein the variable overlaps include a total of *p* short overlaps of length *O* and a total of *q* long overlaps of length *O+* in an overlap sequence, the encoder calculating the overlap sequence using an algorithm that repeats after N frames.

The Office action asserts that because Fielder discloses generating a sequence of overlapping segments of audio information, one of skill in the art would find it obvious to have short and long segments. The applicants note that Fielder does, in fact, teach the use of short and long segments (Fielder, FIGs. 12-15). However, the Office action's assertion does not address calculating the overlap sequence of short and long segments using an algorithm that repeats after N frames, as specifically claimed in claim 18.

Because the Office action fails to address where the prior art teaches each of the elements of claim 18, the applicants respectfully maintain that the rejection of claim 18 under 35 U.S.C. 103(a) over Fielder is unfounded, and should be reversed by the Board.

CONCLUSIONS

Because the applicants teach and claim a new and useful method for encoding the audio data of audio-video material to assure lip-sync and to avoid audio artifacts, the applicants respectfully request that the rejection of claims 1-16 under 35 U.S.C. 101 be reversed by the Board, and the claims be allowed to pass to issue.

Because the applicants' written description provides full, clear, concise, and exact terms so as to enable any person skilled in the art to make and use the invention as claimed in claims 17-21, the applicants respectfully request that the rejection of claims 17-21 under 35 U.S.C. 112, first paragraph be reversed by the Board, and the claims be allowed to pass to issue.

Because Fielder fails to teach encoding audio frames using a defined sequence of frame lengths, as claimed in each of the applicants' independent claims 1, 13, and 17, the applicants respectfully request that the Examiner's rejection of claims 1-4 and 13-17 under 35 U.S.C. 102(a) be reversed by the Board, and the claims be allowed to pass to issue.

Because the Office action fails to identify where the prior art teaches each of the elements of claims 18-21, the applicants respectfully requests that the Examiner's rejection of claims 17 and 19-21 under 35 U.S.C. 102(a) and claim 18 under 35 U.S.C. 103(a) over Fielder be reversed by the Board, and the claims be allowed to pass to issue.

Respectfully submitted

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CLAIMS APPENDIX

1. A method of audio encoding a stream that carries audio and video data, including:

encoding the audio data to provide a mean effective audio frame length $\overline{F}$ that equals a video frame length $1/f_V$ over an integral number M video frames,

wherein the encoding includes varying lengths *F* of the audio frames j in a defined sequence of frame lengths $F(j)$.

2. The method of claim 1, wherein the frame length *F* is adjusted by varying an overlap *O* between successive audio frames.

3. The method of claim 1 or claim 2, wherein the value $F(j)$ repeats periodically on *j*, the periodicity of $F(j)$ defining a sequence of frames.

4. The method of claim 3 having M video and N audio frames per sequence, each audio frame being composed of *k* blocks of *t* samples each.

5. The method of claim 4, wherein a total overlap O_T between frames in the sequence is equal to $O_T = p \times O + q \times (O+1)$, where *O* is an overlap length in blocks where $p \in \aleph \wedge q \in \aleph \wedge O \in \aleph \wedge O_T \in \aleph$.

6. The method of claim 5, wherein only audio frames corresponding to a particular video frame are overlapped.

7. The method of claim 6, wherein $p = (N-M) \times (O+1) - O_T$ and $q = (N-M) - p$.

8. The method of claim 5, wherein only audio frames corresponding to a particular video sequence are overlapped.

9. The method of claim 8, wherein $p = (N-1) \times (O+1) - O_T$ and $q = (N-1) - p$.

10. The method of claim 5, wherein any adjacent audio frames are overlapped.

11. The method of claim 10, wherein $p = N \times (O + 1) - O_T$ and $q = N - p$.

12. The method of claim 4 in which $\exists n \in \aleph^* : n \times t = M \times \left(\frac{f_A}{f_V} \right)$.

13. A method of audio encoding a stream that encodes audio and video data, including

encoding audio samples of N quasi video-matched audio frames in frames with a defined sequence of overlap lengths,

wherein an effective length of the audio frames coincides with a length of a sequence of M video frames, where M and N are positive integers.

14. A data stream encoded by the method of claim 13.

15. The data stream of claim 14, wherein each of the audio frames is tagged to indicate a size of the audio frame.

16. The data stream of claim 14, wherein each block of each audio frame is tagged to indicate whether or not the block is a redundant block.

17. An audio encoder for coding audio for a stream that carries audio and video data, wherein the encoder produces audio frames of variable length such that a mean effective audio frame length $\overline{F}$ equals the video frame length $1/f_v$ over an integral number M video and N audio frames, and the audio frames j each have a variable overlap that provides an effective length *F* in a defined sequence of frame lengths $F(j)$ at encoding.

18. The audio encoder of claim 17, where the variable overlaps include a total of *p* short overlaps of length *O* and a total of *q* long overlaps of length *O+* in an overlap sequence, the encoder calculating the overlap sequence using an algorithm that repeats after N frames.

19. An audio decoder for decoding a stream that encodes audio and video data, wherein the decoder calculates an expected effective frame length of an incoming frame based on a defined sequence of frame lengths, adjusts the actual length of the incoming frame to make it equal to the expected frame length, determines whether any block within a received frame is a redundant block or a non-redundant block, mapping the non-redundant blocks onto sub-band samples.

20. The audio decoder of claim 19, wherein the decoder is configured to modify the overlap status of blocks in the data stream by application of one or more of a set of block operators to each block.

21. The audio decoder of claim 20, wherein the set of operators includes one or more of: NOP, an operator that does not change the status of a blocks; DROP, an operator that changes the first non-redundant block from the head overlap into a redundant block; APPEND, an operator that changes the first redundant block from the tail overlap into a non-redundant block; and SHIFT, an operator that is a combination of both DROP and APPEND operators.

EVIDENCE APPENDIX

No evidence has been submitted that is relied upon by the appellant in this appeal.

RELATED PROCEEDINGS APPENDIX

Appellant is not aware of any co-pending appeal or interference which will directly affect or be directly affected by or have any bearing on the Board's decision in the pending appeal.